SCHOOL OF COMPUTER PROGRAMMING

PRACTICAL PROGRAMMING IN BASIC

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We reserve the right to revise the course of study and the instructional materials, and to withdraw or substitute for the items of equipment offered.

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STUDY GUIDE

ASSIGNMENT ONE

Ignore the Sinclair handbook and the Study Units told to consult them in this Study Guide.

Your first unit introduces you to the history of, the use of and writing programmes for a computer. When you are satisfied that you know Unit 4701 thoroughly, answer the Test Paper at the end and send your answers to the School for correction.

Note the method of numbering the lines in tens. The reason for this is to allow space for omissions or additions without disturbing the rest of the programme. For example, suppose that in the programme on page 20 you later decide that you would also like to know A + B - C, then would could type in:

```
15 Y = A + B - C @
35 PRINT Y @
```

Note carefully that with Multiple-choice questions, you ring the answer first, in pencil, then transfer your answers to the Answer Sheet IN INK. You submit ONLY THE ANSWER SHEET for correction.

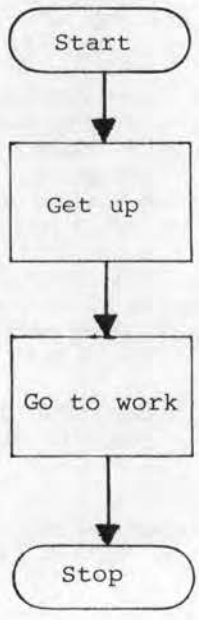
If you do not wish to spoil your Unit, you make take a photocopy of the Answer Sheet and complete that, instead of using the one in the booklet.

ASSIGNMENT TWO

Ignore Unit 24702 and 24703 for the present and instead, read Unit 24704 from pages 1 to 6. Unit 24702 will be sent later for reference.

Flowcharting is a difficult concept in as much as initially, one cannot chart completely until all the relevant facts are known. As an example, consider the steps from getting up in the morning to starting off for work.

Initially we would probably have the following:



Note carefully that the start and stop windows mean nothing more than that. They are not part of the operation but merely flags to tell you where the programme starts and where it finishes. It does not mean that you go to work and then stop going to work. It means merely that you have stopped flowcharting at that point.

You can make flowcharts as simple or as elaborate as you wish or as circumstances demand. There is, however, no need to go to extremes by constructing a flowchart that is virtually a programme.

Study Unit 24704 as far as the bottom of page 26.

You should ignore all technical references and diagrams at this stage but learn the following:

RAM = Random Access Memory = Memory
CRT = Cathode Ray Tube = Screen also known as
VDU = Visual Display Unit.

The 'Mailing List' flowchart shows a box labelled 'Clear The Screen! This is merely for the sake of completeness as, usually, the programmer will arrange automatically for the screen to be cleared. The box is therefore unnecessary.

When part of a flowchart is being discussed, a broken line means that there are other steps before and after these being discussed.

A 'trailer record' is a 'flag' which may be a word such as 'ends' or part of a sentence such as 'this' in the ending sentence 'This tape contains 204 addresses'.

Read Unit 26396C, pages 1 to 39 inclusive and, when you are satisfied, send in your solutions to Test 76819A attached hereto.

ASSIGNMENT THREE

Study the remainder of Unit 4704 and submit your answers to Test 4 in due course.

In the payroll example, forenames are shown only because they are short. In practice you would, of course, use surnames. The 'Hours Worked' and 'Pay Rate' columns would not appear on the screen but would be printed on the relevant pay slip. Programmer's check No. 4 shows this method.

Note the following: A record is all the data related to any one particular item. On page 13, 'John' to '66061' is one record. A file contains a number of such records.

ASSIGNMENT FOUR

Read Unit 4703 until you are confident that you can attempt Test 3. It should be realized that the peripheral equipment discussed is for general information. You are not expected to know how they operate.

ASSIGNMENT FIVE

I M P O R T A N T

PLEASE READ THIS BEFORE GOING FURTHER.

If you do not know how to connect up and tune your TV please ask someone to show you how. DO NOT MEDDLE UNLESS YOU KNOW EXACTLY WHAT YOU ARE DOING.

The various connections are shown in Unit 5 and also in the Sinclair handbook in Chapter 1, together with some technical details.

You will need two power points; one for the power of your TV and the other for supplying the transformer; NOT THE COMPUTER.

At a later stage in your studies, you will need a tape recorder. If you already have one then you may have problems if you have a very expensive one. The tape itself should be of reasonable quality, the best quality is not recommended. If you have a tone control it should be set to maximum treble and minimum bass as the output when run blank should be reasonably 'hissy'.

Should you wish to purchase a tape recorder, make sure that it has a counter built in. Buy the cheapest one you can unless you are going to use it for recording speech or music when you should get the best you can afford.

Although you computer is robustly constructed, the electronic parts are delicate so do not bash it or bang it around.

We wish you lots of fun and enjoyment with the Sinclair 1500. Don't expect to become an expert programmer overnight. Keep practising and experimenting and don't forget to let the family join in the fun.

Before you start practising on your computer, I want you to notice two keys on the keyboard:

Key A on which is the word STOP and

the SPACE key which has BREAK printed above it.

When using the keys only, it is not possible to do any damage to the computer's memory or your TV. Any key may be depressed and if you do not depress it as instructed, all you will do is to give the computer a headache, whereupon, it will sulk and the screen will be completely blank.

For any sort of operation, the screen must have something on it, even if only wavy lines. A completely blank motionless screen means that there is something wrong.

More than likely, you did it through inexperience. To rectify the matter. First try to restore the TV screen to its normal happy condition by depressing:

Key A and SHIFT key, both AT THE SAME TIME

Try this once or twice and, if the screen still remains blank try a more drastic measure by depressing

BREAK. The SHIFT key is not depressed here.

This should bring some sort of indication on to the screen - propably a K. Now depress ENTER twice and all should be in order.

In the event that the screen is still a blank, then the last resort is to switch off the power at the mains outlet. The screen will probably 'snow' and black out but, when power is restored and Key 3 is pressed, there should be a K in the bottom left hand corner.

If this method does not restore the screen to normality, then it means that your connections are faulty. Read Chapter 1 of your Computer handbook showing the correct connections.

Incorrect connections can damage your computer and your TV.

Differentiate carefully between the use of "(shifted P) to give an alphabetical command to the computer and ""(shifted Q) which is used for quotations. When "" is used, only one " will appear when RUN.

By this time, you should have learned that BASIC keywords are printed above the keys, whilst functions are printed below keys.

Make sure that you know the difference between a command (has no line number) and a statement (which requires a line number)

Power Supplies

Unlike the computer whose genie is beneficient, public power supplies are often full of gremlins.

Your computer is rated at 9 volts but you will find that it operates better by using the 12 volt transformer setting. This is because whilst the computer operates at 9 volts, the mains fluctuates and can supply transformed voltage at less than 9 volts thus causing problems.

When you come to use a tape recorder, you will find that very often you cannot LOAD your tape back in to the computer. The cause of this is mostly due to an inadequate power supply. If you have a battery-operated tape recorder, then make sure that you have new batteries or not less than half-used batteries in it. Lack of power will not show up as, on the screen, it will appear as if the programme is being LOADED whereas nothing is happening. Change the batteries.

If you have a mains adapter, once again, the same situation exists as for your computer. Change to twelve volt transformer and you should have no further problems.

This change to a higher transformed voltage should be perfectly safe because all electrical products have a safety margin and the extra three volts will not affect anything, especially when it is considered that, when transformed from the mains, the voltage will only be about 10½ volts in any case, and will probably fluctuate between 9½ and 11½ volts.

With battery-operated sets, you should not try to attach additional batteries because: they are unnecessary; they look unsightly; and you may overload the circuits.

Having got all the connections to work properly, you should now study Unit 4705 and learn the fascinating science of computer programming. Do not be discouraged if it takes you a little time to learn to do so. Like most other skills, it is not easy but it is never dull.

It is very important that you learn this Unit thoroughly as it is the basis for all your future learning. Take your time over it and practise as often as you can.

When you are confident, submit Test Five for correction to the School.

ASSIGNMENT SIX

Have you fully understood the calculations required for changing from one system to another in Unit 4706?

If you are interested, these changes are part of a system known as *Scales of Notation* and you can play happily by changing from one scale to another. They all work on the same principle: divide the decimal number by the base and take the remainders:

Binary	Ternary	Quaternary	Quinary
2)50	3)106	4)106	5)106
2)25 + 0	3)35 + 1	4)26 + 2	5)21 + 1
2)12 + 1	3)11 + 2	4)6 + 2	5)4 + 1
2)6 + 0	3)3 + 2	4)1 + 2	5)0 + 4
2)3 + 1	3)1 + 0	4)0 + 1	
2)1 + 1	3)0 + 1		
2)0 + 1			
Ans: 111 010	10 221	1 222	411

These are usually written to show the base as 106_3 = 10 221 or 106_5 = 411. Because the universal system is (or will be) base 10, we do not usually bother to show the base 10 for the decimal system and, in any case, it is superfluous.

It is interesting to realize that some twenty years ago, we dealt quite happily with various bases and, in fact, America still does. They still have, (as we used to have) binary (2 pints = 1 quart); quaternary (4 quarts = 1 gallon); base 22 (22 yards = one chain); octenary (8 furlongs = 1 mile) and many others. Many of the older generation are still quite capable of dealing with base 20 and base 12 when they talk about £ s d.

Note that in every case we use division. It is, of course, quite possible to convert any base to any other base. This can be done in either one or two steps depending on your expertise. Suppose you have to convert 411_5 to ternary. You can either:

convert 411_5 to base 10 and then convert to base 3; or

(if you are smart) convert directly from base 5 to base 3.

Here is how to do a direct conversion.

Primarily, you must fix it in your mind that you are dealing with a base completely different from the decimal base. In other words your multiplier must always be the base being converted. Let's convert 411_5 to base 3.

3)411 (base 5)	
3)120 + 1	
3)21 + 2	
3)3 + 2	Ans: 10 221 as before
3)1 + 0	
3)0 + 1	

The catch is to remember to operate in fives. 3 into 4 (1st line of working) goes 1, as usual, because 3 is less than 4. But...there is one over and this 1 must be treated as 5 and not 10. Thus, 1 over times 5 plus 1 (second figure) equal 6 and three goes into this exactly twice thus the second division gives 2. Three into 1 won't go so write Ø and carry the remainder out (+ 1).

In the second line of working, (120 ÷ 3), 3 won't go into 1. 1 × 5 (not 10) + 2 = 7. 7 ÷ 3 = 2 and 1 over. 1 × 5 + Ø = 5. 5 ÷ 3 = 1 and 2 over.

In line 3 (21 ÷ 3); 2 ÷ 3 won't go. 2 × 5 + 1 = 11. 11 ÷ 3 = 3 and 2 over.

And so on until you are left with a Ø and remainders. Try this with the others.

Of course, the principle is the same when working in the various bases e g:

$411_5 \times 3$ (i e all in base 5) =

$$\begin{array}{r} 411 \\ \times\ \ 3 \\ \hline 2233 \end{array}$$

Don't forget: 3 × 4 in quinary = 12 ÷ 5 = 2 and 2 over.
3 × 4 in DECIMAL is 1 and 2 over.

Because the base is 5 it follows that 411 × 5 = 4 110. Work it out. 5 × 1 = 5 or Ø and 1 to carry. 5 × 1 + 1 = 1 and one to carry. 5 × 4 + 1 = 21 which, divided by 5 is 4 and one over. Altogether 4 110.

Division is no problem. 411 ÷ 3

$$3\overline{)411}$$

$$120,131313\ldots\ldots\ldots \quad \text{or } 120,\dot{1}\dot{3}$$

Addition is no hassle.

$$\begin{array}{r} 411 \\ 314 \\ \hline 1230 \end{array} \qquad \begin{array}{r} 3442 \\ 2334 \\ \hline 11331 \end{array}$$

Subtraction likewise:

$$\begin{array}{r} 411 \\ 314 \\ \hline 42 \end{array} \qquad \begin{array}{r} 3442 \\ 2334 \\ \hline 1103 \end{array}$$

Just remember to work in 5s instead of 10s.

Although not explicitly stated in the Unit, the colon (:) and the full stop (.) cannot be used to control spacing.

Whilst this Unit is an essential part of your studies, we will add a little variety by introducing you to graphics.

With Unit 24706, you will find a pad of sheet entitled 'Plotting Matrix'. Notice that each sheet is composed of 22 × 32 large squares and four times that number of small squares. Each large square is a 'block' and each tiny square is a 'Pixel'.

Pixels are controlled by FOR.....PLOT.....NEXT instructions.

Enter:

```
1Ø FOR A = Ø TO 63

20 PLOT A,Ø

4Ø NEXT A
```

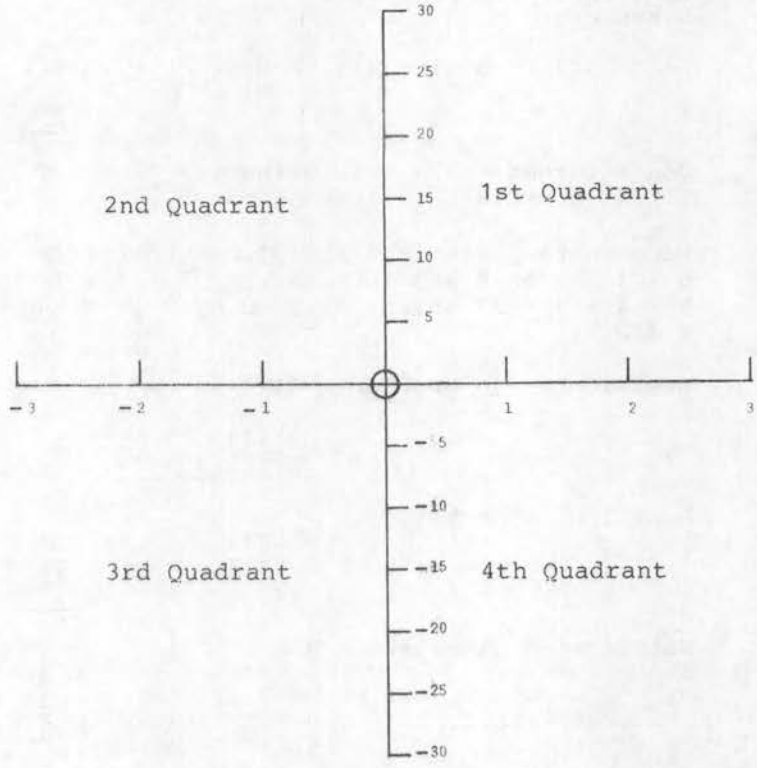
Yes, I have omitted line 3Ø on purpose. Run this and you will have a straight line at the bottom of the screen.

The pixel plotting matrix consists of 64 cells across and 44 cells numbered from bottom to top.

Each pixel can be identified by a matrix number i e two figures separated by a comma. Ø,Ø indicates the bottom left hand corner pixel; 1,Ø is the next cell to it along the bottom. Ø,1 is the next cell *up*.

This follows the usual mathematical procedure for graphic method viz, the across line is called the a-cross or X-axis whilst the vertical line is called the Y-axis. The point on the X-axis is *always* shown first.

If you haven't met one before, this is a mathematical graph:



The distances between the points on the axes must be identical but they need not have the same values. This has been shown above. The point of intersection is called the origin which is indicated by the small circle (or letter 0) at the crossing point.

For our present study, we will use only the 1st quadrant as this can be used for any mathematical or non-mathematical purpose. The 4th quadrant can be used occassionally for non-mathematical graphs but the 2nd and 3rd quadrants are primarily for mathematical operations only.

Coming back to our pixels, what would you expect the matrix points for the top right hand corner to be? Quite right; 63,43. And the centre of the matrix? This is tricky as the exact centre is the line between 15 & 16 and the line between 10 & 11. The four pixels 31,22; 32,22; 31,21 and 32,21 form a block in the exact centre and this little programme will plot it:

```
1Ø PLOT 31,22

2Ø PLOT 32,22

3Ø PLOT 31,21

4Ø PLOT 32,21
```

We can, of course, do this without using pixels. We use our graphics instead. Care must be exercised here because whilst pixels work on the usual mathematical rule of indicating the X-axis first, blocks print the Y-axis first. All very confusing and one can only assume that the manufacturers slipped up.

To use PRINT then, type in the following programme (you can add it to the previous one):

```
5Ø CLS

6Ø PRINT AT 10,15; "G3G"; TAB 16; "G4G"; AT 11,15; "G2G";
   TAB 16; "G1G"

7Ø GOTO 1Ø
```

After a short while, you will become cross-eyed so depress BREAK and then ENTER twice.

Note the CLS instruction at line 5Ø. This is to remove the previous blob so that the new one can be substituted.

If you wish, you can insert:

```
55 PAUSE 3Ø
```

and this will allow a little more time to elapse before the second blob appears. Refer to Chapters 7 and 13 of your handbook for further information on CLS and PAUSE.

Again, note the difference between our first program and the second one. The first one enabled us to draw a line because the NEXT instruction made the computer first print a pixel at Ø,Ø; then a pixel at 1,Ø; then one at 2,Ø and so on until the last one was 63,Ø. The second programme let's us print pixels only at selected positions.

Because the first matrix-point or cöordinate is on the X-axis, and the second cöordinate is on the Y-axis, the instruction PLOT A makes the computer print Ø,Ø and then automatically adds 1 to register A so that the next operation makes the computer print Ø + 1,Ø or 1,Ø. Again, the computer adds 1 automatically to the last instruction so that the next matrix-point becomes 1 + 1,Ø or 2,Ø and the computer prints at that pixel point. And so on until the whole line is printed.

Now change line 1Ø to read 1Ø FOR A = Ø TO 43 and run it. The line now stops at point 43 on the X-axis.

So far, so good.

Now, change line 2Ø to read 2Ø PLOT 0,A. What should we expect? Don't read any further until you have had a shot at working it out for yourself.

Because the X-axis is now Ø, the computer will operate only on the Y-axis instruction and will print Ø,Ø; Ø,1; Ø,2 in succession. This time, the line will run up the screen on the left hand side along the Y-axis.

Smart, aren't you? And, furthermore you are quite right in thinking that you can combine the operations. Change line 1Ø back to Ø TO 63 and type new instructions as follows:

```
3Ø PLOT A,Ø
```

Run it and we have the satisfaction of seeing the two lines produced at the same time. We have, in fact, drawn half of a square.

Note that although line 1Ø reads Ø TO 63, the computer cannot go further than 43 upwards so that the bottom line stops also at 43. This shows that, whilst you can construct a square in one operation, you cannot construct a rectangle in one operation.

The NEXT instruction acts as a GOTO loop which in effect, means that at that point the computer is told to GOTO line 2Ø AND LET A = A + 1. When 43,43 is completed, the operation stops. Note that it does not matter if the FOR...TO instruction is in excess of the number of pixels available, so long as it is not less than.

If we want to complete the frame, how can we proceed? By this time you will have realised that we should be able to get a right hand line by the instruction:

```
2Ø PLOT Ø,43
```

No matter what you do, the picture will always start at Ø,Ø. But, we want the line to start at 43,Ø and finish at 43/43. Also, we want the top line to start at Ø,43 and finish at 43,43.

This is not possible with what we know so far as the points of origin are not the same.

However, suppose that we say that if we draw reverse lines with the point of origin at 43,43, then what? We would have the situation where the computer must (if it can) start at 43,43 and progressively reduce by 1 until the top lines reaches Ø,43 and right hand line reaches 43,Ø.

Fortunately, the computer can do this if we add the following programme to the one we already have:

```
5Ø FOR A = 43 TO Ø STEP - 1

6Ø PLOT A,Ø

7Ø PLOT Ø,A

9Ø NEXT A
```

and this should do the trick. Note the minus 1 takes off 1 at each repeat so that the X-axis finishes with Ø,43 and the Y-axis finishes with 43,Ø as required.

This is fine, but how do we get from one NEXT loop to the next one? When the computer has completed the first loop it cannot do anything further, so it scans the next line (if there is one) and carries on with that one. Thus the computer whizzes round and round from lines 1Ø to 4Ø until A = 43 when it then goes to line 5Ø and gyrates between lines 5Ø and 9Ø after which it becomes exhausted and stops.

Run this, and you should complete the square.

Just for fun, type:

```
8Ø PLOT A,A
```

What do you think will happen when you RUN it? Try to work it out before RUNning it.

Attached is a programme which will draw a frame and include some details. Note how the relevant starting point for each line is indicated in the PLOT statement, whilst the length of the line is determined by the FOR...TO...instruction.

Although the uprights have been designated as B, any other letter (including A) will do. Using a different letter makes it easier to read the programme and eliminates any confusion.

The second programme attached is a Bar Chart. At this stage, just learn how to make one and adapt it for your own purposes.

There is, of course, no reason why the graphics cannot be used instead of the pixel set up. Exactly the same result can be achieved if we write the following programme:

```
1ØØ PRINT (shifted 6 or 7) depending on whether you
    want the line to appear on line 42 or 43.
```

In order to use the graphic symbols you must always perform these operations:

1 Hold down SHIFT

2 Print inverted commas - "

3 Depress shifted key 9

4 Type the graphic required

5 When finished with graphics, depress shifted 9 again,

6 Type " again

7 Release SHIFT

With all the above operations, the SHIFT key must be held down with the following two exceptions:

1 If a blank is required (= 4 pixels) release SHIFT and type SPACE

2 If any characters other than graphic symbols are required, release SHIFT and type as usual. However, to get back to ordinary characters, SHIFT must be held down and key 9 depressed.

It must be realized that if characters are typed when in the graphic mode, inverse characters will be typed.

We can now take the PRINT programme a stage further:

```
11Ø LET A = Ø

12Ø LET B = Ø

13Ø LET C = 21

14Ø LET D = Ø

15Ø PRINT AT A,B; "G" (where G is the symbol chosen)

16Ø PRINT AT C,B; "G"

17Ø LET B = B + 1

18Ø GOTO 12Ø

21Ø PRINT AT A,B; "G"

22Ø PRINT AT A,D; "G"

23Ø LET A = A + 1

24Ø GOTO 21Ø
```

and again you have a rectangle.

The main purpose of PLOT is to graph calculations which PRINT cannot do because it can print only blobs instead of pixels. Type and RUN this programme:

```
11Ø FOR A = Ø TO 1ØØ

12Ø IF  A = 23 THEN GOTO 21Ø

13Ø LET B = 1.2^^A

14Ø PLOT B,A

15Ø NEXT A
```

and the result is a graph of compound interest at 20% p a for 23 years.

Add the following:

```
21Ø FOR C = 1 TO 24

22Ø IF  C = 24 THEN GOTO 31Ø

23Ø LET D = 0.2^C

24Ø PLOT C,D

25Ø NEXT C

31Ø LET D = D + 1

32Ø PRINT AT Ø,Ø; A,"R";B,,,C - 1,"R";D
```

This superimposes the graph of simple interest at 20% p a and then prints out the amounts available after 23 years.

You can now fiddle around with this programme. Change line B to 1,3 (or whatever) and line 23Ø to 0,3^C (or whatever to agree with line 13Ø). Change line 32Ø (or add additional lines) so that captions are provided e g COMPOUND INTEREST FOR YEARS AT PERCENT IS (so much); the same for simple interest. Make the computer print out at the top of the screen its calculations for lines 13Ø and 23Ø.

Submit your answers to Test 6.

ASSIGNMENT SEVEN

Unit 4707 and supplement give details of peripheral equipment and how it is used. After thorough study and assimilation of the entire Unit, submit your answers for correction.

ASSIGNMENT EIGHT

In Unit 4708 we meet a useful commercial programme. In this Unit, the PAUSE statement is introduced. Study also your handbook.

Get into the habit of using REM statements. A useful trick is never to use exact tens, hundreds, and thousands when writing a programme. Keep them for REM statements i e 1Ø, 1ØØ, 2ØØ, 3ØØØ, 4ØØØ etc. It does not matter if gaps are left in your programme, the computer merely takes the next instruction in its stride. This means that there are no problems if your programme is, say

```
13Ø  LET.....

14Ø  PRINT......

15Ø  IF....

2ØØ  REM TO CREATE DEBTORS' STORE

21Ø  ETC.....
```

Do not follow the dating system in the Unit. America is very much behind us in standardization. Always insert the date as YYMMDD. Actually, all computers, even those built in America, have this dating system built in to them so you will not be rowing against the stream in using it.

Make certain that you can use GOSUB properly. In the same way that FOR must have a NEXT statement, so must GOSUB have a RETURN statement.

Send in your answers to Test 8.

ASSIGNMENT NINE

Notice in Unit 4709 the use of NOT (variable) = (independent). As explained, the NOT qualifies the symbol and not the variable e g:

```
IF NOT A = B THEN.....
```

does *not* mean that any letter *except* A may equal B; the meaning is that if A is *not equal* to B then...

When calculating Income Tax in the example, don't try to be clever and substitute RSA Income Tax. After all, these are only figures which you are learning to manipulate and it is the principle that is important and not the actual system.

As, no doubt, you are in employment, consider one of your systems (no matter how trivial) and try to write a programme that will give you the answers you require. Do this as often as you can.

We look forward to receiving your answers to Test 9 in due course.

ASSIGNMENT TEN

Study unit 4710 thoroughly and submit your answers to Test 10. Unit 4702 is for reference only.

ASSIGNMENT ELEVEN

Unit 4711 is your final assignment. You have already practised some of the drawings illustrated.

Certain statements e g ARCSIN, ARCCOS, ARCTAN, LN etc are mathematical keys and their use is explained in your handbook. You will only use them for special occasions and this course does not pretend to give explicit instructions on their use.

Unit 4702 explains the mathematical concept of your computer. It is included for interest and you should try to understand it. Take your time reading it as the test is not required.

Please submit your final Test 11 for grading. We hope that you have enjoyed this course and that you will put it to use. Don't forget that you can actually buy prepared programmes on cassette that will work on your computer - we don't sell them.

If this course has whetted your appetite for computer programming knowledge, you may be interested in our COBOL Course. For further information all you have to do is attach a request to your Final Test.

LINE	KEYWORD	TITLE INDEX
5	REM	TITLE = "1" - INDEX
1Ø	REM	TO DRAW CROSS LINES
2Ø	FOR	A = Ø TO 63
3Ø	IF	A = 63 THEN GOTO 21Ø
4Ø	PLOT	A,Ø
5Ø	PLOT	A,43
6Ø	PLOT	A,39
7Ø	PLOT	A,35
8Ø	PLOT	A,31
9Ø	PLOT	A, (You can add others as required)
19Ø	NEXT	A
2ØØ	REM	TO DRAW UPRIGHTS
21Ø	FOR	B = Ø TO 43
22Ø	IF	B = 43 THEN GOTO 31Ø
23Ø	PLOT	Ø,B
24Ø	PLOT	13,B
25Ø	PLOT	24,B
26Ø	PLOT	63,B
27Ø	NEXT	B
28Ø		
29Ø		
3ØØ	REM	TO PRINT DETAILS
31Ø	PRINT	AT 1,1;"TITLE";TAB7;"COUNT";TAB13;"DESCRIPTION"
32Ø	PRINT	AT 4,4;"1";TAB9;"1Ø";TAB13;"TAPE INDEX"
33Ø	PRINT	AT 3,4;"2";TAB8;"125";TAB13;"BAR GRAPH"
34Ø	PRINT	AT (You can add others as required)
4ØØ	REM	TO SAVE FOR POSTERITY
41Ø	STOP	
42Ø	SAVE	"1"
43Ø	GOTO	2Ø

LINE	KEYWORD	TITLE BAR CHART
5	REM	TITLE = "2" - BAR CHART
1Ø	REM	TO DRAW AXES
2Ø	FOR	A = 4 TO 63
3Ø	PLOT	A,2
4Ø	NEXT	A
5Ø	FOR	A = 2 TO 43
6Ø	PLOT	2,A
7Ø	NEXT	A
1ØØ	REM	TO WRITE CAPTIONS M = 1ØØØ
11Ø	PRINT	AT Ø,Ø;"M"
12Ø	FOR	B = 19 TO Ø STEP - 2
13Ø	PRINT	B
14Ø	PRINT	
15Ø	NEXT	B
16Ø	PRINT	AT 21,1;"Ø";TAB3;"1993";TAB9;"1992";TAB15;"1991";TAB21;"1990";TAB27;"1989"
2ØØ	REM	TO WRITE CHART
21Ø	FOR	C = 3 TO 2Ø
22Ø	PRINT	AT C,4"g SPACE SPACE g"
23Ø	NEXT	C
24Ø	FOR	D = 6 TO 2Ø
25Ø	PRINT	AT D,10;"g SPACE SPACE g"
26Ø	NEXT	D
27Ø	FOR	E = 11 TO 2Ø
28Ø	PRINT	AT E,16;"g SPACE SPACE g"
29Ø	NEXT	E
3ØØ	FOR	F = 14 TO 2Ø
31Ø	PRINT	AT F,22;"g SPACE SPACE g"
32Ø	NEXT	F
33Ø	FOR	G = 6 TO 2Ø
34Ø	PRINT	AT G,28;"g SPACE SPACE g"
4ØØ	REM	TO SAVE
41Ø	STOP	
42Ø	SAVE	"2"
43Ø	GOTO	2Ø

ICS

ANSWER PAPER

To avoid delay, please insert all the details requested below

Subject FLOWCHARTING Course PRACTICAL PROGRAMMING IN BASIC

Student's Reference (Letters / Figures)	Serial Number	Test No	Ed No
/	76819A	1	2

Tutor's Comments

Grade	Tutor

Name

Address

Post Code

Study the questions overleaf and record your answers in the matrix below by writing a cross (X), in ink, through the letter which you consider to be the correct answer. Submit ONLY this answer sheet to the School for correction DO NOT SUBMIT THE QUESTION SHEET. All questions must be attempted.

1.	A	B	C	D
2.	A	B	C	D
3.	A	B	C	D
4.	A	B	C	D
5.	A	B	C	D

6.	A	B	C	D
7.	A	B	C	D
8.	A	B	C	D
9.	A	B	C	D
10.	A	B	C	D

TEST PAPER

Name	Student Reference
Address	

Serial No.	Ed.	Test	SUBJECT
76819A	2	1	PRACTICAL PROGRAMMING IN BASIC

Only if this test is shown in your study programme under 'Tests' should this test be sent to the School for correction in which case, please complete the spaces in the above heading.

Study each question carefully and circle, in pencil, the letter beside the one answer which best answers each question.

Check your answers and, when you are satisfied with them, transfer your choice to the answer sheet provided in front of this test by making a cross (x) through the letter chosen for each question.

If you do not want to damage your unit, then please take a photocopy of the answer sheet only and submit it instead of the one in the book.

DO NOT SUBMIT THE QUESTION PAPER.

1. Instead of writing the same series of instructions for each card read, the programmer can use

   A. an exit
   B. a loop
   C. a decision table
   D. a cross-reference

2. Decision tables are related to the use of dicision symbols in flowcharting. To what type of coding instructions are they Related?

   A. Input
   B. Output
   C. Editing
   D. Branching

3. The natural way to read a program flowchart is

   A. top to bottom and right to left.
   B. top to bottom and left to right.
   C. bottom to top and left to right.
   D. bottom to top and right to left.

4. Although they may vary, a typical flow-chart form has

   A. 5 vertical rows, with 10 blocks in each row.
   B. 5 vertical rows, with 5 blocks in each row.
   C. 10 vertical rows, with 10 blocks in each row.
   D. 10 vertical rows, with 5 blocks in each row.

P T O

5. How many sections are contained in a standard decision table?

   A. Four
   B. Three
   C. Two
   D. One

6. On a flowchart, the fact that current output information will be used as input information in a subsequent cycle is shown by

   A. a communication link symbol
   B. an on-page connector symbol
   C. a broken line
   D. a solid line

7. The symbol used to indicate master or transaction records stored on storage devices is the

   A. document symbol
   B. input/output symbol
   C. auxiliary operation symbol
   D. disk, drum, random-access file symbol

8. Symbols on a system flowchart indicate the

   A. method of operation
   B. details of each operation
   C. order to operations
   D. specific applications for operations

9. With what type of programming instruction would the term 'house-keeping' be most closely associated?

   A. Write
   B. Clean
   C. Add
   D. Branch

10. Arrowhead symbols should be usedon flowcharts to indicate

   A. an exit from a decision symbol
   B. emphasis on a particular program instruction
   C. that the flow of direction is not normal
   D. that the chart is continued on a subsequent page.
